

REMARKS

Claims 1, 2, 4, 6-10 and 12-17 are pending in this application. Claims 1, 2, 4 and 6 have been amended so as to change the term "formed" to --kneaded--. Support for this change to the claims is found, for example, at page 8, line 16 to page 10, line 10 of the specification. Support for the change at the end of claim 1 is found, for example, at page 1, line 22 to page 2, line 5 of the specification (describing examples of unstable terminal groups), along with page 3, lines 1-6 of the specification (describing how unstable terminal groups are removed). It is submitted that all of the subject matter of the presently pending claims is fully supported by the original disclosure of the present application and introduces no new matter.

Request for Entry of Claim Amendments

It is respectfully requested under 37 C.F.R. § 1.116 that all of the above-noted changes to claims 1, 2, 4 and 6 be entered of record and fully considered by the Patent Examiner, since these changes at least place the present claims into better form for consideration on appeal. It is further submitted that these changes are fully supported by the disclosure of the present application and do not introduce issues significantly different from those having been discussed during prosecution of the present application.

Traversal of Unity of Invention Requirement Maintained

The traversal of the outstanding Unity of Invention Requirement, resulting in the withdrawal of process claims 7-10 and 12-17 from consideration, is respectfully maintained for the reasons stated in the Response to Unity Invention Requirement filed April 5, 2002. It is respectfully submitted that the presently withdrawn process claims may be at least rejoined with the presently considered claims, if not fully considered at the present time under the applicable Unity of Invention Requirements.

Issues Under 35 U.S.C. § 102(b) and § 103(a)

Claims 1, 2, 4 and 6 have been rejected under 35 U.S.C. § 102(b) as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as being obvious over Schreyer '083 (USP 3,085,083), Bailey '435 (USP 3,969,435) or Roura '351 (USP 4,001,351).

Claims 1, 2, 4 and 6 have been rejected under 35 U.S.C. § 102(b) as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as being obvious over Carlson '758 (USP 3,674,758) as evidenced by Bro '763 (USP 2,946,763).

All of the above-noted rejections are respectfully traversed for the following reasons.

Present Invention and Its Advantages

The present invention is directed to a tetrafluoroethylene-hexafluoropropylene (TFE-HFP) copolymer (FEP) that has been "melt kneaded" and that has substantially no terminal -COOH, -COF or -CF=CF₂ groups, which are examples of unstable terminal groups. The FEP of the present invention is produced by heating and kneading (i.e., applying a shear force) to the TFE and HFP materials in a moisture-containing atmosphere while these materials are in a molten state. Unless the step of kneading is employed together with the other process steps, the advantageous removal of unstable terminal groups cannot be significantly achieved according to the present invention.

It is submitted for the reasons stated below that all of the cited prior art documents fail to disclose or suggest the employment of a kneading condition while the copolymer is being formed in its molten state. Thus, all of these prior art documents fail to realize the advantages achieved by the present invention upon removal of unstable terminal groups, such as the prevention of disadvantageous discoloration properties.

Submission of Comparative Test Data

Enclosed as Exhibit A is a summary of some comparative test experiments that were conducted in order to establish that unless the kneading step is used, the advantageous removal of unstable terminal groups cannot be achieved obtaining the FEP product of the present

invention. These comparative tests will be placed into the form of an appropriate declaration for submission to the Patent Examiner in the future.

As described and shown in Exhibit A, the conditions of Example 1 of the present application were repeated, except that the conditions described in Example V of Shreyer '083 were used with the FEP copolymer in a "static" state without employing kneading together with the other conditions. As noted in Exhibit A, it is not possible from a practical point of view to reproduce exactly Example V from Shreyer '083. Further, in any case, it is submitted that subjecting Example 1 of the present application to the conditions of Shreyer '083 is completely appropriate so as to establish an appropriate comparison against the "closest prior art".

Exhibit A shows that a significant number of unstable terminal groups remain after the treatment step of Shreyer '083 is applied to the TFE and HFP materials, whereas in contrast, Example 1 of the present specification describes that such unstable terminal groups are removed by employing the kneading step. Consequently, application of the conditions described by Shreyer '083 in which the copolymer is "static" and not melt kneaded, result in the disadvantageous presence of unstable terminal groups, so as to fail to achieve the advantages exhibited by the present invention.

Distinctions Between the Present Invention and Schreyer '083

Schreyer '083 discloses stabilized fluorocarbon polymers, including TFE and HFP polymers, which are treated at elevated temperatures with water in order to attempt to prevent formation of carboxylate groups, as noted at Col. 2, lines 61-63. Shreyer '083 discloses a fluorocarbon polymer having a V.I. (volatile index) of less than 21 after aging as shown in Table IV at Cols. 7-8. Example V at Col. 7 describes that samples of a copolymer of TFE and HFP were washed and subjected to treatments indicating in Table IV and then analyzed with respect to the composition of the end-groups. It is clear from the disclosure and context of Shreyer '083 that the washing and heating were conducted in a "static" condition.

Shreyer '083 fails to disclose or suggest the step of kneading in combination with heating in a molten state in order to obtain the FEP copolymer of the present invention. Shreyer '083 fails to recognize the advantages achieved by the present invention, which include removing substantially all of the unstable terminal groups recited in claim 1, which as noted above, results in advantageous prevention of discoloration. The failure of Shreyer '083 to disclose or suggest the present invention is further evidenced by the comparative test results summarized in enclosed Exhibit A discussed above. Consequently, significant patentable distinctions exist between the present invention and Shreyer '083, such that this basis for the above-noted rejection should be withdrawn.

Distinctions Between the Present Invention and Bailey '435 and Roura '351 Documents

Bailey '435 discloses melt-processable blends of TFE and HFP copolymers in which the copolymer is heated in an oven at a temperature of 340-380°C for about 2-5 hours in an atmosphere of air with water vapor, as noted at Col. 4, lines 34-41. Roura '351 discloses heat-treat melt-processable blends of TFE and HFP copolymers, which are essentially exposed to the same conditions as mentioned in the disclosure of Bailey '435.

Both Bailey '435 and Roura '351 fail to disclose or suggest the use of a kneading condition in combination with heating of TFE and HFP materials in a molten state, as in the present invention. Thus, both Bailey '435 and Roura '351 fail to recognize the advantages achieved by the present invention with respect to advantageously removing unstable terminal groups in order to prevent discoloration as discussed above. Consequently, significant patentable distinctions exist between the present invention and both the Bailey '435 and Roura '351 documents.

Distinctions Between the Present Invention and Carlson '758

Carlson '758 discloses stabilized TFE copolymers which are contacted with methyl alcohol at 0-200°C, as noted at Col. 1, lines 40-54. Carlson '758 discloses in Examples I, II and V at Cols. 3-4 processes for "capping" polymers with methyl ester groups, including a

reference to Bro '763 at Col. 4, lines 63-67. However, Carlson '758 does not indicate that the treated polymers were "molten", and the conditions do not suggest that these polymers were molten. Carlson '758 fails to disclose the combination of a kneading condition with a TFE-HFP material in a "molten" state, as employed in the present invention in order to obtain the FEP copolymer of the present invention. Thus, Carlson '758 fails to recognize the advantages associated with the present invention with regard to removal of unstable terminal groups and prevention of discoloration as discussed above. Therefore, significant patentable distinctions exist between the present invention and Carlson '758 such that this basis for the above-noted rejection should be withdrawn.

It is submitted for the reasons stated above that all of the present claims define patentable subject matter such that this application should be placed into condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Eugene T. Perez (Reg. No. 48,501) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

Attached hereto is a marked-up version of the changes made to the application by this Amendment.

Pursuant to 37 C.F.R. § 1.17 and 1.136(a), Applicants respectfully petition for a three (3) month extension of time for filing a response in

connection with the present application. The required fee of \$930.00 has been submitted with the Notice of Appeal being filed concurrently herewith.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By 

Andrew D. Meikle, #32,868

ADM/ETP/las
0020-4746P

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

Attachments:

Version with Markings to Show Changes Made
Exhibit A

(Rev. 04/30/03)

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims have been amended as follows:

Claim 1. (Three Times Amended) A melt [formed] kneaded tetrafluoroethylene-hexafluoropropylene copolymer containing 1.0×10^{14} spins/g or less of unpaired electrons on the carbon atoms in terms of a spin density measured with electron spin resonance at a temperature of 10K and 50 ppm or less of a basic component, [and] having a volatile index (VI) of 25 or less, and having substantially no terminal -COOH, -COF, or -CF=CF₂ groups.

Claim 2. (Amended) The melt [formed] kneaded tetrafluoroethylene-hexafluoropropylene copolymer according to claim 1, wherein said amount of unpaired electron on the carbon atoms is 1.0×10^{13} spins/g or less in terms of a spin density measured with electron spin resonance at a temperature of 10K and 50 ppm or less of a basic component.

Claim 4. (Three Times Amended) The melt [formed] kneaded tetrafluoroethylene-hexafluoropropylene copolymer according to claim 1 or 2, which is obtained by adding 0.1 to 10 % of a compound comprising an alkali metal or an alkaline earth metal in terms of the number of atoms of the alkali metal or the alkaline earth metal based on the total number of the above terminal groups to the tetrafluoroethylene-hexafluoropropylene copolymer, and heating the tetrafluoroethylene-

hexafluoropropylene copolymer at a temperature of at least 200°C in an atmosphere containing moisture while kneading.

Claim 6. (Amended) The melt [formed] kneaded tetrafluoroethylene-hexafluoropropylene copolymer according to claim 1, 2 or 4, wherein said fluorine-containing copolymer has a melt viscosity of 0.1 to 100 kPa·s at 372°C.

EXHIBIT A
USSN 09/623,756
ATTY. DOCKET NO. 0020-4746P

EXPERIMENTS

It may be best to repeat Example V of Shreyer et al. However, it is practically impossible to repeatedly wash a copolymer to remove any inorganic materials in the polymer, which may be "potassium" compounds, if the polymer of Example V was prepared in the same manner as in Example I. Furthermore, according to the result of the experiments carried out at 260°C in Example V and the experiences of the researchers of Daikin Industries, when a polymer is prepared using a polymerization initiator which does not leave any inorganic materials in the polymer and about 5 to 10 ppm of potassium is added to the polymer, the polymer may have substantially the same properties as one prepared using a polymerization initiator having potassium. Thus, the following experiments were carried out.

The procedures described in Example 1 described in the specification of this application were repeated to obtain copolymer powder. To the powder, potassium hydroxide was added in an amount of (a) 5 ppm or (b) 10 ppm. Then, the powder was subjected to the same treatment as that of Example V of Schreyer et al at 260°C.

The treated polymer was melt kneaded with a kneader under the same conditions as those employed in Example 1 described in the specification of this application to obtain a melt kneaded material. The number of terminal groups and a degree of coloration in each step are shown in the following Table.

Table

Polymer	Treating step	Number of terminal groups				Coloration
		COOH	COF	CF=CF ₂	CF ₂ H	
(a)	Before treatment	530				Ivory
	After thermal treatment	0	70		520	Pale brown
	After kneading	20	70		450	Brown
(b)	Before treatment	530				Ivory
	After thermal treatment				540	Ivory with slight brown
	After kneading		20	*	490	Pale brown

Note: * Trace amount, which could not be quantitatively measured.

The formation of the unstable terminal groups after kneading cannot be suppressed by the treatment method of Schreyer et al.